

Searching for the Missing Martian Organics with the Mars Phoenix Scout Mission

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The Viking GC/MS failed to detect organic material on the surface of Mars. Recent theories [1, 2] suggest that surface organics may be present that were undetectable to Viking. Benner et al. [1] theorize that powerful oxidants might not completely destroy Martian organics, but would instead reduce them to longer lived forms such as benzenecarboxylate. The Viking GC/MS, which pyrolyzed samples at a maximum temperature of 500°C, could not have detected these substances.

Navarro-González et al. [2] report that in the Atacama Desert, the Viking life detection experiments would only have found organic molecules at trace levels, and would have completely failed to find benzene, though it is present in the soil. These samples were pyrolyzed at a temperature of 500°C. When the samples were pyrolyzed at 750°C, the levels of organics (including benzene) were above the published Viking detection limits [3].

The Thermal and Evolved Gas Analyzer (TEGA) on the 2007 Phoenix Lander will be able to detect organic molecules at a sensitivity of a few ppb (similar to Viking); however, the TEGA ovens have a maximum temperature of ~1000°C [4], high enough to reveal the presence of benzenecarboxylates if they exist in the martian regolith at predicted levels. We expect that Phoenix will find organics, present in the form of decay products of more complex molecules.

References: [1] Benner S.A. et al. (2000) *PNAS*, 97, 2425-2430. [2] Navarro-González et al. (2003) *Science*, 302, 1018-1021. [3] Biemann K et al. (1977) *JGR*, 30, 4641-4648. [4] Boynton W.V. et al. (2001) *JGR*, 106, 17, 683-17, 698.